Detailed proposal for the Napoli test

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Workshop on PDE measurement of XA-VD

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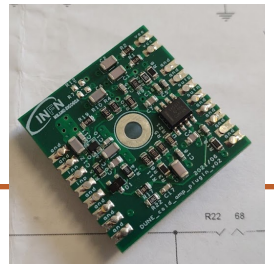
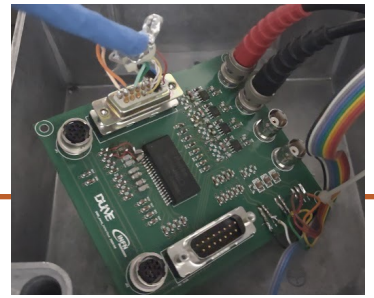
XA-Megacell in Napoli: part procurement

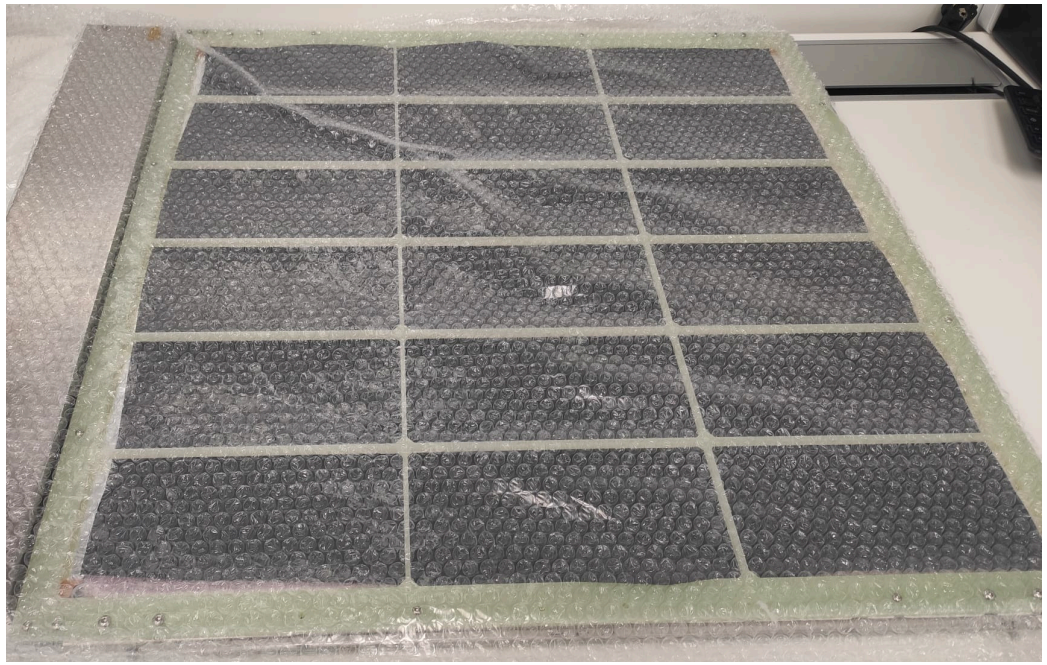
- **New dedicated XA-VD Megacell**
  - The first measurement will be related to XA-VD with copper based read-out electronics
  - **New batch of dichroic filters produced by ZAOT**
  - **Filters are in Brazil for evaporation (we will receive in next few weeks)**
  - Mechanical frame design, top frame should allow use of both filter types (see D. Warner talk)
  - Big WLS light guide plane sent by Mi-Bi and included
  - SiPMs on flex board
  - Blue cables with DB15 at both ends (warm and cold)
  - White flat cables between SiPM and cold electronics
  - Electronics: cold amplifier, warm electronics





In a second phase we foresee to measure PDE with PoF and SiPM optical readout

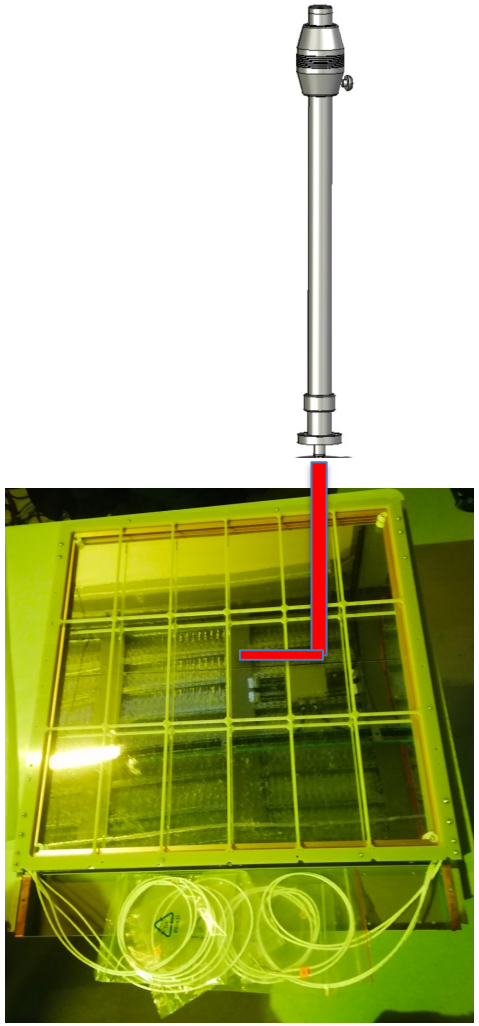
Very good news: XA-VD is just arrived



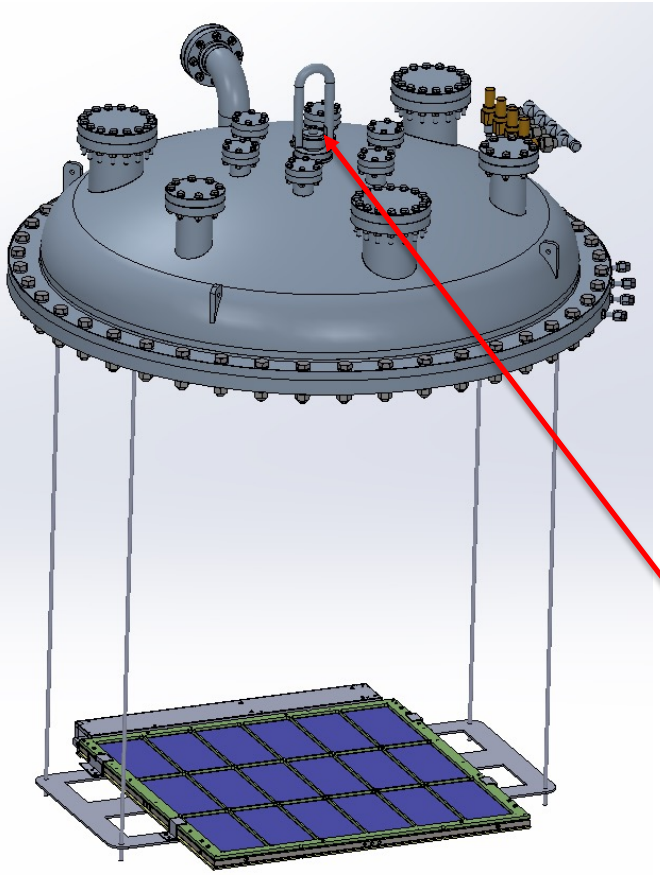
Measurement procedure

- Determination of Single Photo-electron Response of XA-VD: illumination with low light level laser 405 nm
- Scintillation light produced with a low activity (~250 Bq) ^{241}Am is available and already tested in a small x-Arapuca detector
- Source manipulator with the source holder and a rotation system: possibility to change source height and to probe different XA-VD xy positions
- Determination of correction factors: SiPM secondary pulses, LAr purity
- Introduction in the cryostat of a PMT tpb-coated as cross-check
- MC simulation of full system is mandatory (see Ana talk from Campinas group)
- Evaluation of PDE (estimation of N_γ from simulation and possible contribution from reflected photons)

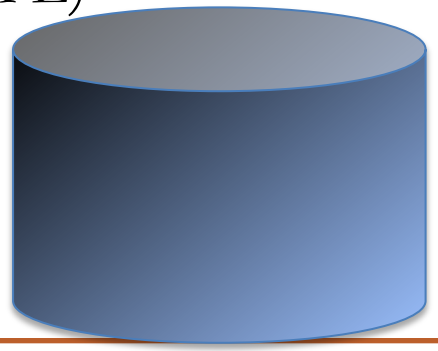
$$\varepsilon_{PDE}(XAMegacell) = \frac{\#PE}{N\gamma} f_{corr}$$

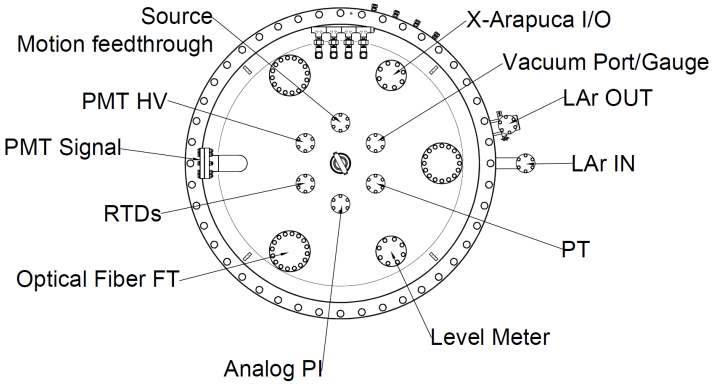


Mechanics and output flanges



- Mechanical frame support designed and sent to production (ready for mid of March)
- Output flanges: 6 CF40, 3 CF63, 3 CF100
- We procured a manipulator (roto-translator) system to host an ^{241}**Am alpha** source (source holder is under design)
- pTP isotropically emitted light could be back-diffused by cryostat walls inside X-Arapuca
- Production of lateral black shielding+ top cap ongoing (black PTFE)





Cables, Electronics and DAQ

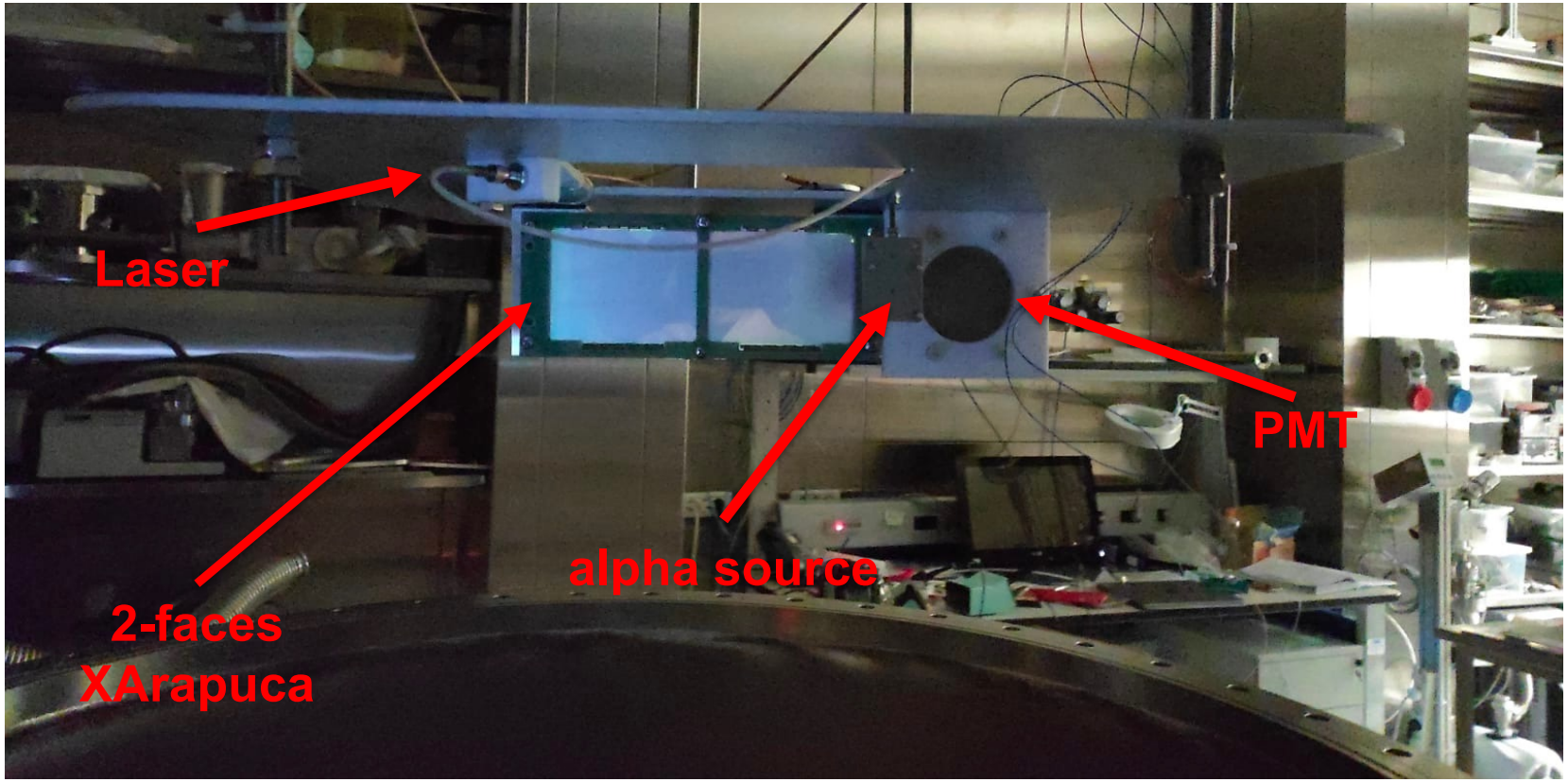
- **Cold electronics**: main board and two cold amplifiers (will be provided by MiB)
- Two-signal readout (80 SiPMs ganging for signal)
- Low voltage, SiPM bias and signals through a DB15-connectorized cable
- Cable provided by CSU and used for both cold and warm sides (CF40 flange with DB15 ordered)
- **Warm electronics**: a second stage amplifier is arriving, C. Gotti new production (see talk)
- **DAQ:** Oscilloscope, CAEN V1725 single ended digitizers (250 Ms/s, 14 bit) with MIDAS interface software for sequenzial data acquistion runs

Commissioning Test

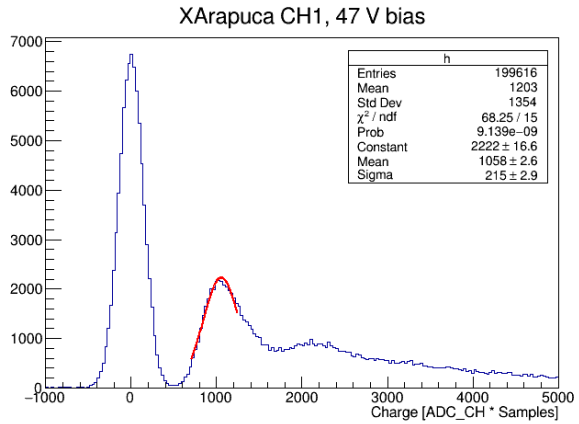
The purpose of the test is:

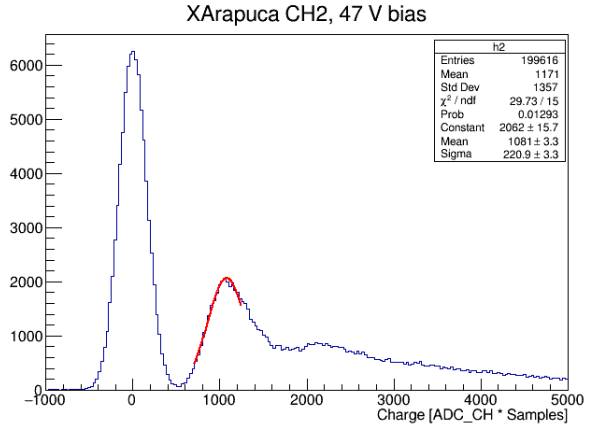
- Check the vacuum in the cryostat
- Check the LAr filling procedure
- Produce scintillation light with alfa source
- Measure scintillation with PMT and SBND 2-faces X-Arapuca
- Preliminary DAQ test
- Check the LAr purity

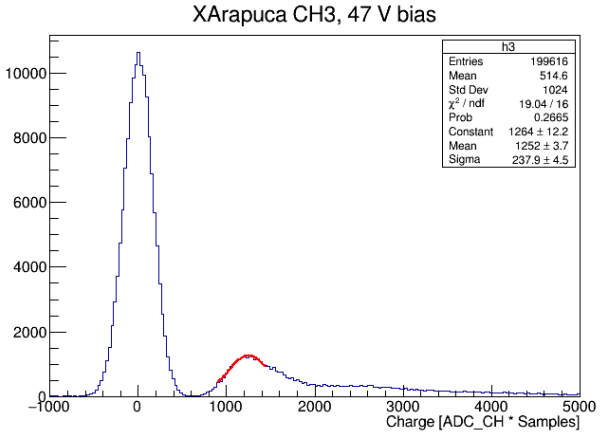
Commissioning Test (2)

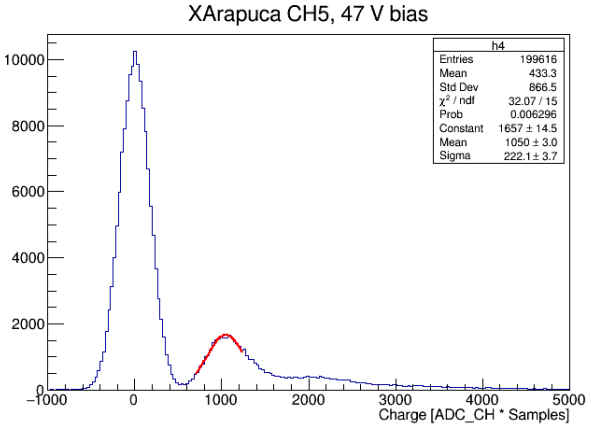


X-Arapuca SPE response

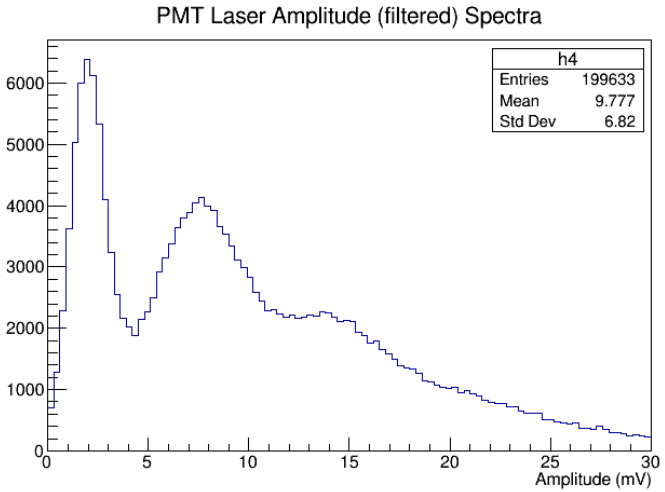






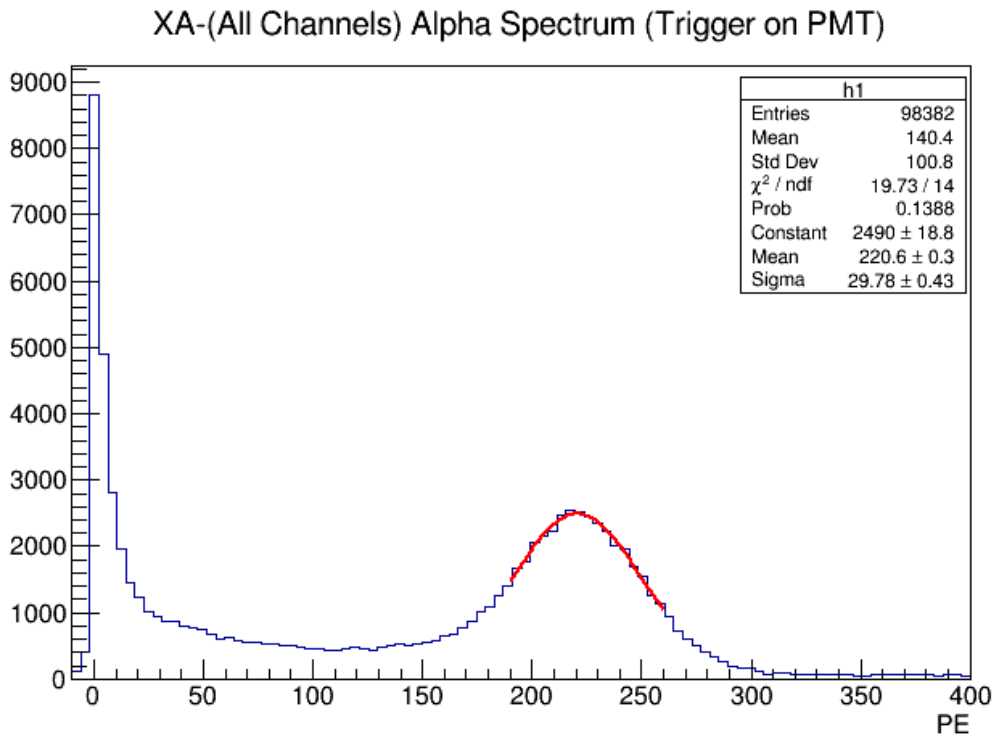


PMT



Alpha source spectrum

X-Arapuca



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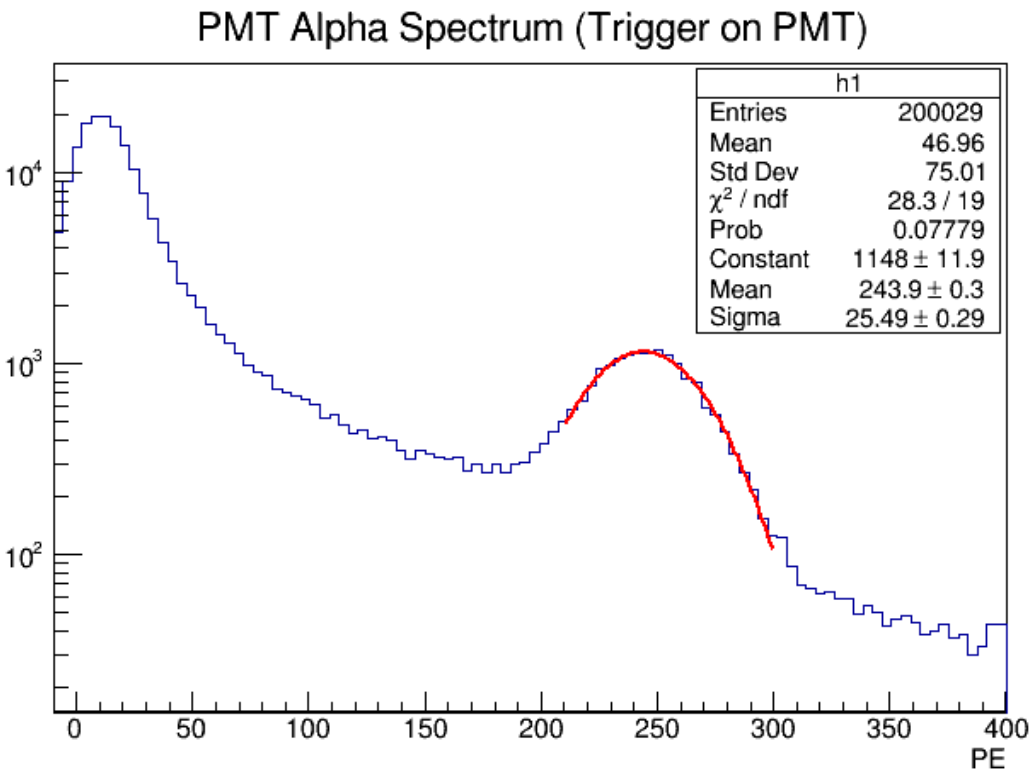
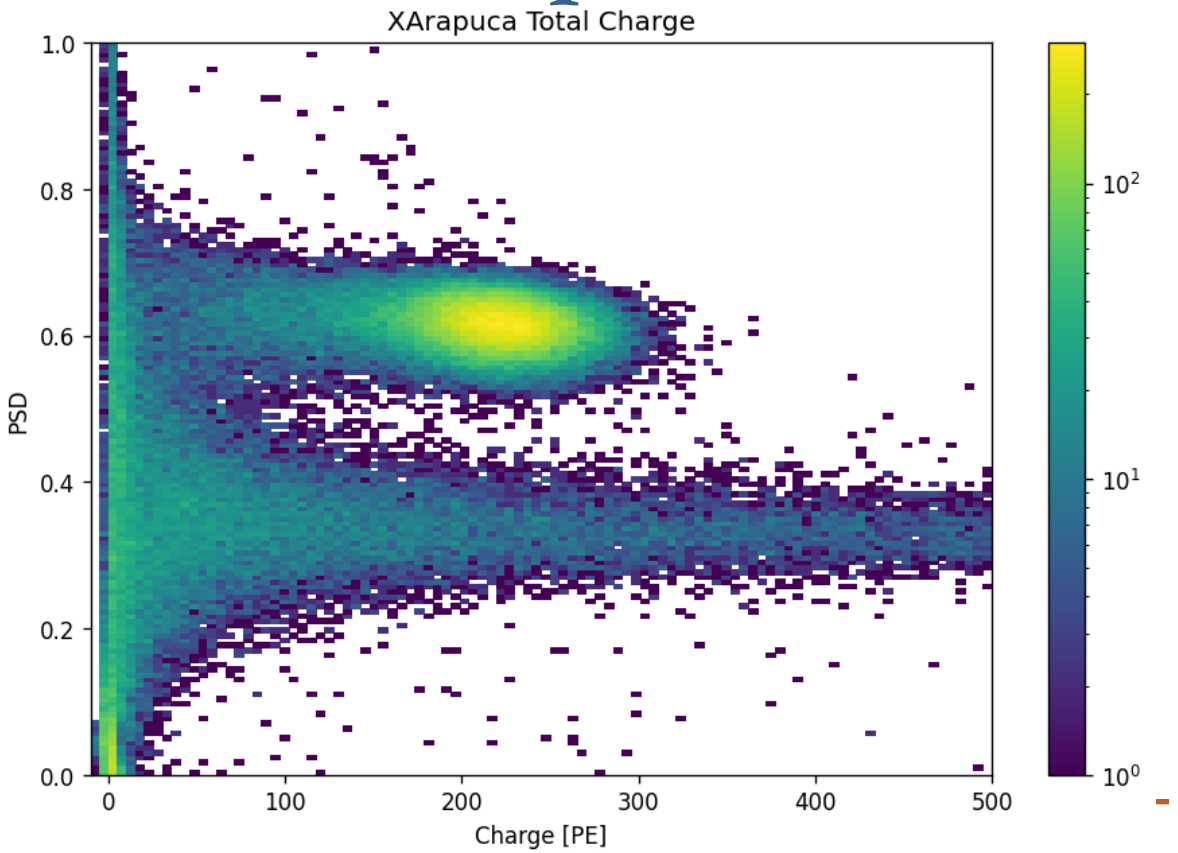


Fprompt alpha/muon separation

X-Arapuca



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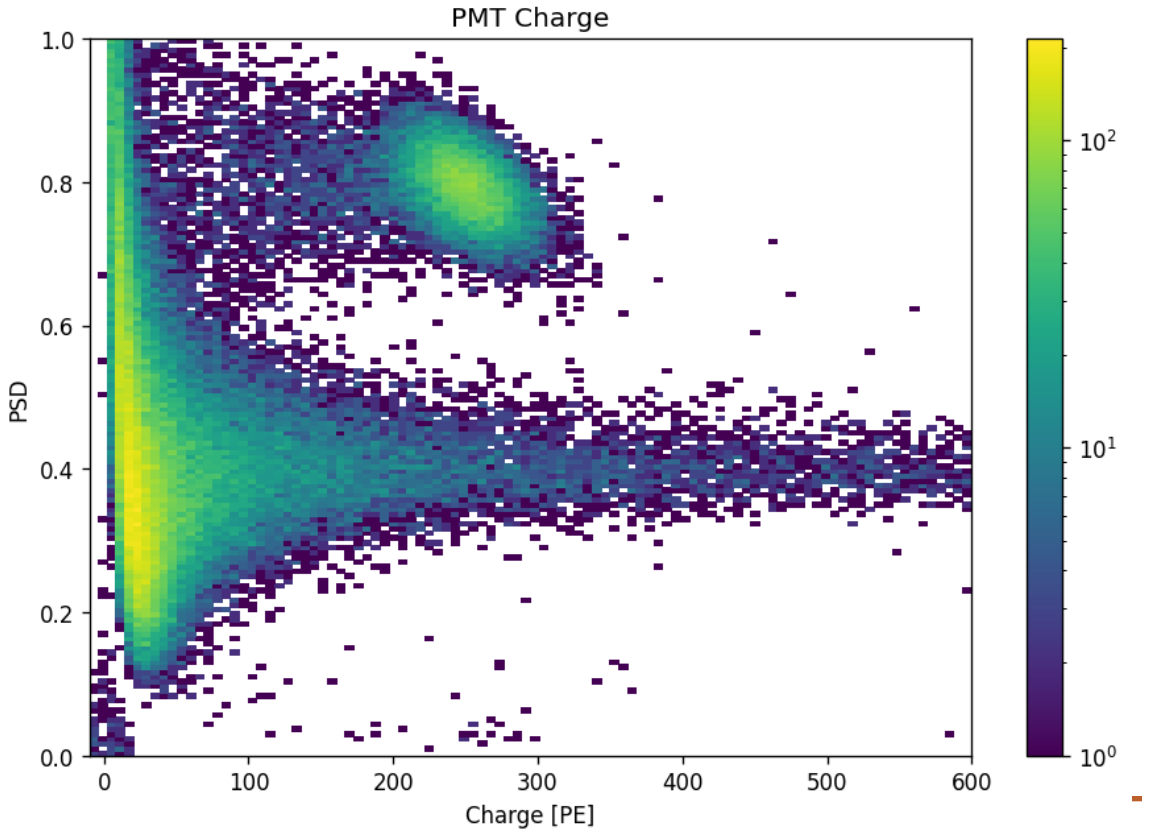

Waveform study in progress

VERY PRELIMINARY

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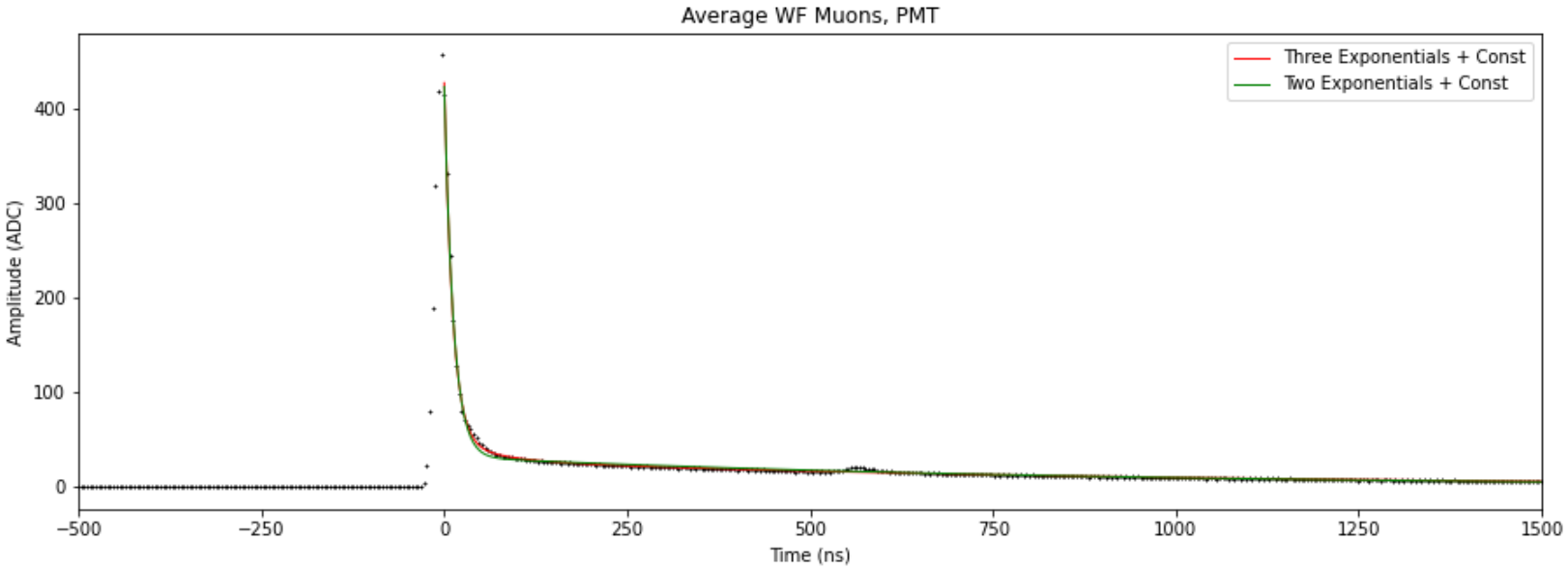

- XA waveform analysis is ongoing
- Required SPE deconvolution
- Find best functional fit
- Preliminary results on waveform reveal some issue on purity level reached in this first test
- Purity LAr correction of 10%

Triplet time constant around 900-950 ns

Conclusions

- The preparation of PDE measurement of XA-Megacell in Napoli Cryogenic laboratory is in progress
- Mechanical support and shielding is going to be finalized
- XA-VD is on the way to Naples
- Commissionig test has been performed:
  - No problems and good indications from cryogenic poit of view
  - Possible improvements in purity to be exploited (Pump and purge, LAr quality procurement)
- A tentative schedule leads us to a possible first measurement at the end of May/beginning of June